SLATE DIGITAL

VIRTUAL TAPE MACHINES

User's Guide

– Version 1.0 –

Slate Digital Virtual Tape Machines

Version 1.0

Advanced Algorithms ™ by Fabrice Gabriel

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Slate Digital Thanks: the amazing designers who made these legendary machines, Deborah Lintz, Howie Weinberg, Wade Norton, Ross Hogarth, and our "fifth Beatle" Jay Baumgardner.

User Manual by Anthony Taglianetti, Steven Slate, & Fabrice Gabriel
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I. INTRODUCTION

By Steven Slate

The first time I put a reel of tape on a tape machine, I was a fifteen-year-old coffee boy, interning at a northern New Jersey recording studio. Even though placing the reel on the machine was similar to letting your kids push the floor button on an elevator, I remember being ecstatic that I was given the opportunity to perform this crucial role. Playing back in my brain was a montage of Kirk, the head engineer, showing me how to properly wrap the tape around the heads. With my heart beating fast, I followed his tutorial with exact precision. Once the session began, I felt a great sense of accomplishment as I watched the reels spinning.

I grew up in the industry listening to tape machines.

Back then it was not clear how magical these machines were. In fact, I recall when the first ADAT digital machines became available. One day, the head engineer at the studio where I was working at came into the control room with a confident grin and announced to us all "Say goodbye to that noisy hiss truck and get ready for the future… digital!" He set up the 16bit VHS recording machine next to the Studer[i] 2-inch machine, and we tracked 8 mics of drums into it. His smile quickly faded. "Something must be wrong, this doesn't sound good at all," he said, as the lifeless and somewhat harsh digital tracks played back. And I realized back then that digital was likely going to solve a lot of problems for this industry… but one thing that it was not going to do, was sound like tape.

Digital has come a long way since the first 16bit VHS recorders. Using a nice converter and clock, you can record an extremely detailed and high bandwidth sound with great resolution and dynamic range. There is surely nothing "wrong" with digital. And perhaps that's the problem.

Two years ago we released a plugin called the Virtual Console Collection, which replicated the signal path of an analog desk. We did this because it was clear that many pro engineers still preferred the sound of old vintage analog desks. And we soon discovered why:

The nonlinear artifacts of analog are pleasing to the human ear.

And just as it is with the circuit of a console, the tape machine has a very unique set of dynamic, nonlinear traits that cause our ears to hear warmth, glue, depth, space, and width. So just as we did with the VCC, we sought to make the absolute most authentic replication of the analog tape machine that the industry has ever heard. And I think we have succeeded.

After more than a year of scientific research and algorithm development, Slate Digital, led by our Chief Technical Officer and head algorithm developer Fabrice Gabriel, have created the Virtual Tape Machines digital audio plugin. Using this plugin, you can have the sound of both, a 2inch 16 track analog deck or a ½" 2 track analog deck… right in your DAW.

Your mixes will come to life. Things will be easier to balance. Tracks will need less EQ and compression. Depth, space, and warmth will be achieved like you've never heard before.

Welcome to the sound of Analog Tape. Your music deserves it.

II. VIRTUAL TAPE MACHINES

Many of you out there are familiar with the physics of tape machine, it's speeds, and the various tape formulas that have been introduced over the last few decades. For those of you who are not, here is a crash course.

THE MACHINES

2-Inch 16-Track

This is the 2-inch Studer[i] A827 with 16-track headstock from NRG Recording Studios. This machine has recorded some of the biggest albums in the world. It has a fat, punchy, thick sound with a very detailed top end. This is the ultimate tracking machine.

½ Inch 2 Track

This is the 2-track Studer[i] A80 RC with ½-inch headstock from Howie Weinberg Mastering. Many recordings have been mastered onto this deck, and it's obvious why! It has a thick low end, nice rich midrange, and a smooth top that perfectly takes away the digital edge in the most natural way.

THE TAPES

The tape formulations that we modeled are two of my favorites, the classic 456 and the more modern GP9. I picked these tapes based on my years of using both, and my knowledge that these represent two very unique sounds.

FG456

456 was introduced in 1975 as a "high output" tape formula that was needed since new tape decks at the time were able to handle higher headroom signals in their electronics. 456 is known as a "+6" tape, which means it's +6dB over the 185 nWb/m standard… which means you have an additional 6dB of headroom before tape saturation occurs.

FG9

GP9 is a more modern tape that has an even thicker layer of oxide and is known as a "+9" tape (570 nWb/m). GP9 became very popular because you could record at hotter levels and not have the same introduction of saturation and distortion.

While the sound of these tapes is subjective, what we notice is that 456 is a bit more colorful with slightly thicker lows. Switching to GP9, you'll notice more punch, due to the fact that you have 3db more headroom before saturation. You may also notice more definition throughout the frequency spectrum, and a slightly more forward sound. Both of these tape types sound really good, and we suggest to experiment with both of them.

TAPE SPEED

"IPS" means inches per second, as in the number of inches of tape that spin around the heads per second. The two professional recording tape speeds are 15ips and 30ips, which were the speeds that we modeled on both of our 2-inch and ½-inch decks.

So what are the sonic differences between these speeds? This is a question that is based on many factors including the machine type, the way it is aligned, and the tape formula.

30ips

The faster speed setting, 30ips, has less noise, an overall flatter frequency response, and a slightly extended high-end. On both of our machine models, 30ips is relatively flat above 200Hz, and then has some emphasis in the higher portion of the low-end.

This is a great speed setting for a pristine sounding high-end with smooth saturation on peaks, and a nice thickening of the upper low-end.

15ips

15ips has a higher noise floor, and a more non-linear frequency response. First you'll notice that the low-end extension is driven down to the sub-lows, below 100Hz. This is one of the reasons why 15ips is often said to be "fatter" sounding. The midrange of both of the machines is a bit extended, which adds a nice presence and bite.

Overall, the 15ips Speed setting on both models is definitely great when you want to add more attitude and flavor to your recordings. And the best part is that you can overcome the extra noise by reducing it with the Noise Reduction slider in the "Settings" panel!

BIAS

The recommended Bias (**Normal**) is dependent on the Tape Type, Tape Speed, and Record Head Gap length. When you switch Machines, Tape Types or Tape Speeds, the Bias is automatically adjusted to the recommended value, internally.

We also modeled two additional Bias settings above and below the recommended Bias value. These additional settings change the frequency response and saturation for each Machine, Tape, and Speed configuration.

With the Bias set to **High**, High Frequencies will saturate earlier. When set to **Low**, High Frequencies will saturate later, with increased dynamics.

III. VIRTUAL TAPE MACHINES – OVERVIEW

FRONT PANEL

Input/ Output
Use the Input level to adjust the level going to tape. The hotter the signal, the more tape saturation and compression will occur. Use Output Level to adjust the level coming off tape.

Input/ Output Link
When activated, this option allows for Constant Gain Monitoring, making it easy to quickly reference the Processed and Bypassed signal, without any difference in volume.

Group Assignment Selector
Assigns the plugin to one of VTMs eight Groups. See the section on Grouping for more details.

Process/ Bypass
Bypasses plugin processing.

Settings
Opens the Settings Panel.

VU Meters
Displays the signal level, post the Input control.

Slate Digital Logo
Opens the Info Panel, which contains the version number

Machine Type
Selects between the 2-inch 16-track (A827); or the 1/2-inch 2-track (A80RC) tape machines.

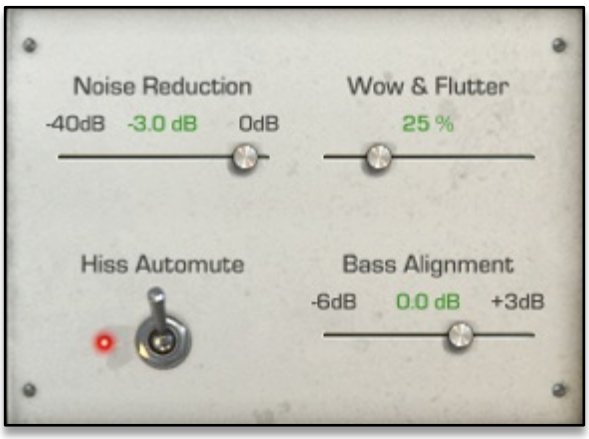
Tape Type
Selects between the vintage FG456 tape, and the modern FG9 tape.

Tape Speed
Selects between 30ips and 15ips.

Bias
Selects a High, Normal, or Low Bias.

SETTINGS PANELS*

All of the settings in the VTM Settings Panels (with the exception of Group Calibration Levels) are GLOBAL. Noise Reduction, Wow & Flutter, Bass Alignment, Hiss Automute, VU Ballistics and Default Group Settings will affect EVERY instance of VTM in your session.



Noise Reduction
We've taken great care to model the noise characteristics of each machine, tape type and speed. This may be undesirable in some situations. This slider allows you to fine tune the amount of tape hiss in your mix. Dragging this slider to the far left will remove noise entirely.

Wow & Flutter
The subtle pitch and amplitude variations inherent in tape machines have been faithfully reproduced with VTM as well. The effect intensifies as the slider is dragged to the right.

Hiss Automute
Automatically mutes the tape hiss when no signal is present at input.

Bass Alignment: Allows for fine control over the low-end response of each tape machine.

VU Ballistics: Adjusts the VU Needle Response to either Fast, Mid, or Slow.

Default Group: Determines which Group the VTM is assigned to upon instantiation. This is very useful for setting up groups quickly!

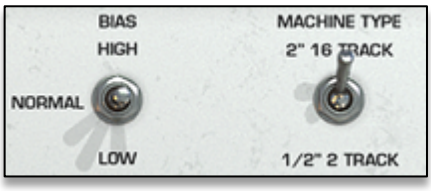
* Unlike VCC, Settings are stored in the Session File and not a separate settings file on your hard drive. If you wish to have your own default settings, we recommend saving VTM presets for recall in your DAW. Please consult your DAW's user manual for instructions on saving presets, and setting a User Default preset.

IV. VTM QUICKSTART

1. Place the Virtual Tape Machines plugin on the first insert of one of your tracks.
2. Assign VTM to Group 1.

3. Copy this instance to the other tracks in your mixer.

4. Using any of the VTM instances, select a Tape Machine, Tape Type, Tape Speed, and Bias. All instances of VTM will slave to these changes!



5. Start playback. Depending on your material, you may need to boost or attenuate the input level of each track to achieve the desired level of tape saturation.

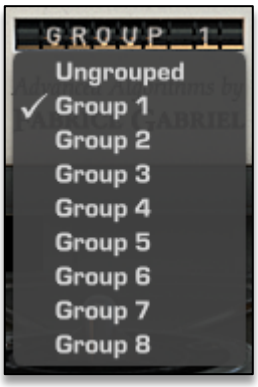
6. Finally, insert VTM across your stereo buss. You can assign it to the same group, or leave it ungrouped to emulate printing your mix to a ½-inch machine!

7. Mix your song!

V. GROUPING

USING GROUPS

Groups make using the Virtual Tape Machines plugin very simple, quick, and intuitive. At its most basic use, you can set all instances to the same group and use the Virtual Tape Machines to emulate mixing off a single tape machine.



VTM Group Assign Menu

You could also use several groups and make your own hybrid tape machine. You can mix and match machines, tape types, speeds, and even bias!

The Virtual Tape Machines has 8 Groups that enable you to slave multiple Tape Channels together. This means that from a single instance, you can control the Bias, Machine Type, Tape Speed, Tape Type, Process/ Bypass, and Input/ Output for every Tape Channel in the Group.

To assign a Tape Channel to a group, click the Group Assign pull-down menu and choose one of VTM's 8 Groups. VTM is now assigned to that group.[†‡]

DEFAULT GROUP

You can quickly assign multiple Tape Channels to a group by using the Default Group feature in the Settings Panel. Click "Settings" and change the Default Group to the VTM Group of your choice. All new instances of Virtual Tape Machines will be assigned to this group by default. This makes group setup quick and easy!

VTM Default Group Setting

PROCESS/ BYPASS

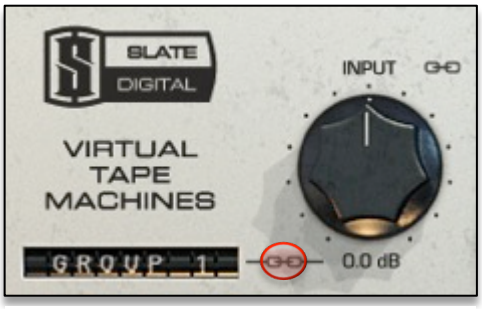
You can bypass the Tape Channel processing for an entire Group by hitting the Process/ Bypass switch on the front panel. This switch also disables processing for a single Tape Channel if it is ungrouped.

[†] *When assigning a Tape Channel to a Group, all parameters will be initialized. We recommend assigning the Tape Channel to a group BEFORE adjusting any parameters.*

[‡] *Pro Tools Multi-Mono: Due to the nature of our grouping system, the Group Assign parameter will not Link to other Multi-Mono Channels. It is recommended that you use the Link function, instead of our grouping system in this configuration. VTM's front panel parameters will link correctly across all channels.*

ISOLATING THE GAIN STAGE FROM A GROUP

Sometimes you will want to customize the Input or Output of a particular track within a group. For instance, you may have your drums in a group with your Input at +2dB. However, you want to add more saturation to only your snare.



The Group Isolate toggle, highlighted in red.

To isolate the gain stage from the group, simply click the “Link” symbol between the Group Assign menu and the Input value display. The symbol will dim to show the change. Now, you can adjust the gain section of this channel independently from the group. To add it back to the group, simply click the “Link” symbol again!

The isolated Input and Output value is not cumulative to the group value; it is absolute.

AUTOMATING VTM GROUPS

It is possible to automate every parameter of the Virtual Tape Machines plugin. When an instance is grouped, you may automate any of its parameters on any track. This allows for ultimate ease of use and flexibility.

However, it is up to you to ensure there are no automation conflicts across multiple instances of a group – otherwise, your automation will not be written/ read correctly.

VI. Common Mixing Questions

How hard should tape be hit?
This depends on what you want to achieve and what is your mix.

If you have a lot of bass in a Hip Hop mix, you can try to saturate the tape a lot. For a clean sound, you don't want too much saturation. Slowly raise the Input of your track until you begin to hear distortion (this level will depend on the content of your mix or tracks). Then back off on the input by .5dB.

Hitting 0dB VU is the best way to maximize the tape sound, i.e. the best noise/saturation ratio. As always, experiment and use your ears!

What is the preferred order of processing?
To simulate the typical signal flow when mixing a multi-track session recorded to tape, we recommend the following:

1. VTM as the first insert on every track in your mix, set to the 2" 16-Track Machine.
    a. Tape Type, Speed, and Bias to taste.
2. VCC Channel as the second insert on every tack in your mix.
3. VCC Mixbuss as the first insert on your Master Fader.
4. VTM as the last insert on your Master Fader (but before any limiting), set to the ½" 2-Track Machine.
    a. Tape Type, Speed, and Bias to taste.

This effectively reproduces the signal flow of mixing off a 2" 16-Track tape machine, into console channels, through it's mixbuss, and printing the mix to a ½" 2-Track tape machine.

Of course this all depends on what you want to achieve for the order of processing. What is cool with plugins is that you can do whatever you want. It's totally up to you!

For instance, I used to stack up several instances of the VCC Mixbuss with different consoles to obtain the color I wanted. It's pretty amazing what it can do this way. So here, like all plugins, the more creative you are, the better.

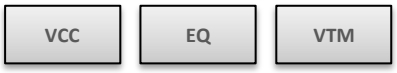
Personally I'd use a different order of plugins depending on my track. For instance on a vocal track, I'd use the following chain:

I want to use the deesser with the more pronounced sibilants possible, and fix them as soon as possible in the processing chain with both the deesser and the Virtual Tape Machines. If you push the VTM, it acts as a vocal smoother and a kind of deesser, very complimentary from a regular deesser.

In this scenario, I want to take advantage of the Virtual Tape Machines harmonics, smoothing, and distortion to warm it up, and to even attenuate/boost them with the EQ. I want to take also advantage of the compression aspect of the VTM to feed the VCC, where I can add some final subtle flavor.

I'd try several bias settings depending on the high frequency reduction behavior I want (which are all far different from a simple EQ). So for instance, I'd use the 2" with FG456, 30ips High Bias, and play with the IN/OUT linked levels to have the highs I want.

For a piano track, I would use a different configuration:



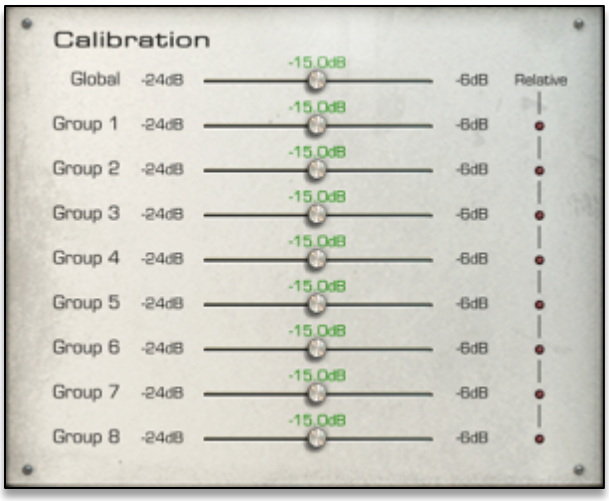
For the piano, I'd use the VCC Mixbuss to get some cool stereo and harmonic effects, then EQ, then VTM with not too much noise and just a little bit of flutter. Here, I just would like to add to the sound. A little bit of smoothness for high amplitudes, but I don't want to use the VTM as the same high frequency reduction tool than for the vocals. I just want to warm up the sound a little and make it less sterile.

Here I'd use the 1/2" FG9 15 ips with Normal Bias.

VII. ADVANCED SETTINGS

CALIBRATION LEVELS

The VTM Calibration Settings are useful to quickly set up the processing of the tape, to get it hotter (more saturation, better signal-to-noise ratio), or quieter (less saturation, more noise).


Calibration
Global -24dB -15.0dB -6dB Relative
Group 1 -24dB -15.0dB -6dB
Group 2 -24dB -15.0dB -6dB
Group 3 -24dB -15.0dB -6dB
Group 4 -24dB -15.0dB -6dB
Group 5 -24dB -15.0dB -6dB
Group 6 -24dB -15.0dB -6dB
Group 7 -24dB -15.0dB -6dB
Group 8 -24dB -15.0dB -6dB

In order to be properly calibrated, the VU meters need to display 0dB with a 1kHz sine wave is played at -18dBFS, with an -18dB Calibration Level.

To get the signal hotter, you have to ***decrease*** the calibration level. If you process a -18dBFS peak sine wave, and change the calibration level to -24dB, the VU meter will show +6 dB VU, thus the tape processing will be hotter, i.e. with more saturation. ***Increasing*** the calibration will yield less saturation, with a higher noise floor.

The VU meter level is “linked” to the saturation level of the tape, so whatever the calibration, the same VU meter display should give the same amount of saturation.

DEFAULT CALIBRATION

We wanted the needle to not be too hot by default, because we wanted the user to use the Virtual Tape Machines at the right calibration, preferably with the needle around 0dB VU.

I also wanted the VU Calibration and the Model Calibration to be coherent with what I measured with the real tape, knowing that there is no "right" calibration with real tape, for several reasons:

- Calibration, i.e. relation between Input/ Output/ Saturation levels, depends on the technician who set up the machine, on the tape, etc.
- The same tape formula could be calibrated in several ways, i.e. the GP9 has more headroom, but some engineers chose to have the same headroom with a lower noise floor, which, at the end, is the same thing on the tape itself, but regarding the input/output, is not the same.
- Calibration also depends on the machine maintenance, model, etc.

What I did for the algorithm was achieve coherence between all Tape Type/Machine Type/ Tape Speed variations. For instance, the FG9 has more headroom and less noise than FG456; the ½" Machine has more headroom than 2" machine, etc.

This is representative of the fact that when two tape machines are calibrated the same way with same Input/ Output gains, but which may not be the case with far different calibrations or configurations.

That's why after discussing with many tape technicians, we found it very useful to feature calibration settings, which are representative of reality.

We set the Virtual Tape Machines default calibration to -15dB because we thought it was more representative to the default saturation level a real tape machine would exhibit, with typical RMS levels of digital files. In other words, we wanted the user to load the VTM and to have the "typical" tape sound with the most common digital files.

Wade Norton (NRG Recording Studios), who is one of the best tape technicians in Los Angeles, calibrated the tape machines for testing. We also hired several other tape techs, and it was very interesting to see that the calibration and the SOUND was different with the same tape machine, according to the calibration which was done by different techs. The best sound we got from the tape machines was from Wade's calibration.

VU AVERAGE POSITION & SOUND

One common mistake is to believe that the VU Meter is dependent on the Calibration Level, when it is not. The VU meter reflects the saturation level of the tape, so whatever the Calibration Level, a 0dB VU will always have the same effect on the sound. For instance, if you have an input averaging at –18dBFS and a –18dB Calibration Level, the VU will show 0dB VU. If you change the calibration to say, -15dB, the VU will then show –3dB, but also the algorithm saturation will be changed. To get the same saturation level, you'll have to raise the input by 3dB, thus raising the level of the VU back to 0dB.

The best approach is indeed to start with the level at 0dB VU, and then increase or decrease the IN/OUT linked level to change the saturation behavior. On some tracks, I want to push the saturation as far as I can before there is too much audible saturation; on other tracks I just want a subtle effect. The good thing is that each tape/speed/machine has a different behavior, so by changing the IN/OUT levels, I can tailor how the processing will react!

NOISE REDUCTION

We believe that Tape Hiss is an important component in the sound of tape. We have meticulously modeled the noise characteristics for each Machine, Tape, Speed, and Bias configuration. The “noise” you are hearing is not the product of a noise generator. It is a faithful replication of Tape Hiss.

By default, Noise Reduction is set to -3dB. You may find the tape hiss to be too much, especially if you have multiple instances spread across an entire mix! Luckily, you can dial in the perfect amount of tape hiss using the Noise Reduction slider, located in the Settings Panel.

BASS ALIGNMENT

In a real tape machine, the Bass Alignment would be dependent on the tech's calibration. The bass alignment setting is not a simple EQ that modifies bass roll off. It takes care of the bass behavior of the tape, and then enhances or reduces it. The Bass Alignment slider influences bass and sub-bass frequencies.

Thus, it’s different for each tape model, tape machine and speed since the calibration made by a tech on a real tape machine would be dependent on these parameters as well.

It could be very useful in different mixing situations, similar to the changes a tech would make according to a mixing engineers request. For example, one may want to add some typical bass from a tape, especially for Hip Hop, RnB, etc. It may be easier using the Bass Alignment to get the right amount of bass in your mix.

For mastering purposes, it may be useful to lower the Bass Alignment to have a more neutral behavior in the bass and the way that tape processes the bass frequencies will help that, while still keeping the typical tape bass sound.

WOW & FLUTTER

Wow & Flutter is intended to precisely emulate what happens in a real tape machine. The subtle pitch and amplitude variations inherent in tape machines have been faithfully reproduced with VTM. The effect intensifies as the slider is dragged to the right.

Our measurements show that a precisely tuned and carefully maintained tape machine had a flutter which corresponds to the 25% Setting.

Most tape machines are around the 50% setting, and not very well maintained tape machine is at 100%, which can be still interesting. While this may be undesirable in some circumstances, it would have been completely unrealistic to omit this aspect of analog tape from the VTM.

You can turn off the Wow & Flutter effect by setting the slider to 0%.

HISS AUTOMUTE

Automatically mutes the modeled Tape Hiss when there is no audio present at the input.

VU BALLISTICS

Chooses the speed of the VU Meter needles. The Fast mode will react very quickly and precisely to oncoming audio, where the Slow mode will react less precisely to individual audio pieces.

VIII. System Requirements & Installation

PC Requirements (RTAS, VST)

- Hardware: Dual Core Intel or AMD Processor (Quad-Core Recommended), 2GB RAM, iLok2.
- Operating System: Windows® XP, Windows Vista® (32/64 Bit), Windows 7® (32/64 Bit)

Mac Requirements (AU, RTAS, VST)

- Hardware: Dual Core Intel Processor (Quad-Core Recommended), 2GB of RAM, iLok2.
- Operating System: Mac OS® X 10.5 or later

INSTALLATION INSTRUCTIONS

iLok License Downloading

Before downloading the iLok license for VTM, make sure you have installed the latest iLok drivers for your system. You can download the latest installers here:

- iLok drivers for Mac OS: http://sw.ilok.com/macextsx.dmg
- iLok drivers for Windows: http://sw.ilok.com/DriverSetup.exe

In order to download your iLok license to your iLok 2 dongle, please visit the link that was given to you in your email receipt and enter the required info including the issued pass code. This will unlock your iLok redemption code. Use this code via your iLok account's "Redeem License Code". Enter the iLok code, and then download the license on your iLok 2 dongle.

Installing the VTM

Click on the INSTALL icon. Choose your designated VST, AU, or RTAS folder (usually the default location that the installer insists will be best).

User Manual

The Virtual Tape Machines User Manual will be installed in the following location:

Windows 7: C:\ProgramData\Slate Digital\Virtual Tape Machines
OS X: /Applications/Slate Digital/Virtual Tape Machines

You can also access the User Manual by clicking the text "**Virtual Tape Machines**" from the Info Panel (Accessed by clicking the Slate Digital Logo).

IX. 3RD PARTY ILOK LICENSE TRANSFER FEE

When reselling any Slate software product, there will be a $30 License Transfer Fee in order for us to process the new customer into our user database. It is the responsibility of the seller to inform the buyer of this fee at the time of sale.

X. CONCLUSION

MAKING THE VIRTUAL TAPE MACHINES

By Fabrice Gabriel

After the success of the Virtual Console Collection, Steven and I were convinced that the sound of tape was still not authentically modeled in the digital domain. In fact, it didn't seem that anyone had accurately captured the essence and feeling of a real tape machine. We wanted to change that.

I was convinced that I could design an algorithm that would be so close to the tape sound, that you could not distinguish a track recorded to the real tape machine versus the same track processed with the algorithm.

The most important thing for us is to have the most absolute authentic sound. At Slate Digital, our mission is for people to not be able to differentiate from the real thing, so it's really important to reproduce faithfully and accurately the exact sound and behavior of a real tape machine, and here are the reasons.

First, our purpose is to make sound replicas, not average sound imitations. For years, there have been a lot of companies who advertise that they "precisely model" certain pieces of analog hardware, and still today, there are a lot of products which "imitates" the analog sound, rather than accurately replicating it.

For me, it's really easy to see in their algorithm what they did and how they did it, what they missed and where technical issues are. Some people who are not familiar with the original hardware may not be able to tell the difference. But any professional who has used the real hardware certainly can.

In order to be authentic, an algorithm must be faithful to every aspect of the original gear it is intended to replicate. It means that both the original and the model should produce the same output waveform with the same input waveform, with any kind of waveform. It also means that the frequency response should be the same in every situation, every amplitude.

But there are a lot of other aspects, which need to be reproduced, like the dynamics, the harmonic behavior, the saturation characteristics, and so on.

Most importantly, the scientific tests are nothing without real life listening tests. That's why Steven and I compare and test the algorithms against the real thing, and then several experienced mixing and mastering engineers validate them.

We stop refining the algorithms when we can't tell the difference between the original and the algorithm in a blind listening test.

We chose to offer a tape replication because it was clear that tape had not properly been represented in the digital domain yet.

I guarantee that I took care of being very faithful to every aspect of the original tape sound and behavior, that is our mission at Slate Digital, and this is the reason why we say "Advanced Algorithms."

Steven and I are so involved in making the best replications on the market, we hope that people enjoy our products, appreciate their authenticity, and overall, make great music!

Thanks for reading!

- Fabrice Gabriel

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[i] *Studer is a registered trademark of Harmon, and is not affiliated with Slate Digital. Machine names used in this manual are meant solely to explain which tape decks were used in the Slate Digital Modeling process.*